



Promoting Malaysian Traditional Knowledge Using Digital Ethnobotanical Garden Website

Nik Noor Alaina Hisanie Muhamad¹, Mohd Fadzelly Abu Bakar^{1*}, Lim Sin Yee¹

¹Department of Technology and Natural Resources, Faculty of Applied Sciences and Technology, Universiti Tun Hussein Onn Malaysia, Kampus Pagoh, KM 1, Jalan Panchor, 84000 Muar, Johor, MALAYSIA

*Corresponding Author

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Abstract: Erosion of traditional knowledge (TK) is a worrisome issue that is faced globally due to the rapid urbanization and forest loss. Thus, it is vital to protect and preserve the traditional knowledge as it benefits many sectors, especially in pharmaceutical research. This study aimed to promote the traditional knowledge and plant conservation among UTHM students by developing an ethnobotanical garden online website. The ethnobotanical garden located at UTHM Parit Raja Campus was selected as the study site. An online survey was done to understand the students' level of knowledge about the utilization of plants and evaluate the effectiveness of the website towards conservation and promotion of traditional knowledge. The Ethnogarden UTHM website was developed and a total of 23 plants were recorded on the website. A majority of the respondents understood the basic roles of plants in daily lives and the importance of conserving it, but 20% of them were disagreed with the statement of a high reliance on traditional herbal medicine and 37% of them were uncertain about it. After accessing the website, about 83% of the respondents agreed that the development of ethnobotanical garden website could deliver the traditional knowledge effectively and they would promote this website to their families and friends. In short, the development of Ethnogarden UTHM website is a good strategy to promote the traditional knowledge and emphasize the significance of plant conservation among UTHM students.

Keywords: Traditional knowledge, plant conservation, plant species, Ethnogarden UTHM

1. Introduction

Traditional knowledge (TK) refers to a transmission of knowledge about practices or knowledge gained by the communities through experience of centuries and inherited from generation to generation [1]. It is transmitted orally to each generation in the form of stories, songs, folklore, local languages, beliefs, rituals, and agricultural practices [2]. The traditional knowledge can be incorporated in a wide variety of contexts, including agricultural, technical, scientific, medicinal knowledge as well as ecological- and biodiversity-related knowledge. However, in the current era, increasing of forest loss and urbanization has threatened the traditional knowledge of local communities [3]. The loss of traditional knowledge is undeniably impacted by the biodiversity loss. Thus, it is fundamental to preserve, protect and promote the traditional knowledge because of its added-value benefits to the future generation and global biodiversity.

Ethnobotanical garden is defined as a landscape featuring a variety of native trees and plants, and it is an effort for the revitalization of traditional knowledge as well as for cultural and conservation purposes [4]. Most of the plants displayed in ethnobotanical garden are being used for food consumption and are utilized for medicinal purpose and traditional rituals by local communities [5-6]. A successful ethnobotanical garden elucidates the concept of ethnobotany regarding the relationship between people, plants and cultures [4]. Therefore, establishing an ethnobotanical garden is vital, especially in Malaysia, a biodiversity-rich and also a multi-racial country where every ethnic or race develops the ethnobotany system based on their own beliefs [3]. A successful example can be seen in Forest Research Institute Malaysia (FRIM) Ethnobotanical Garden, which has been established in 1995 and it focuses ex-situ conservation of medicinal and aromatic plants (MAPS) used by various ethnics in Peninsular Malaysia. In order to publicize the role of ethnobotanical garden, an internet-based platform is recommended for this purpose.

The ultimate aim of this study was to promote the traditional knowledge and the conservation of plants or herbs among UTHM students by creating an ethnobotanical garden online website. Ethnobotanical documentation was conducted in ethnobotanical garden at Universiti Tun Hussein Onn Malaysia (UTHM) Parit Raja Campus and an online survey was given to UTHM students in order to understand their level of knowledge about the utilization of plants and evaluate the effectiveness of ethnobotanical garden UTHM website towards conservation and promotion of traditional knowledge.

2. Methods

2.1 Study Site

The study was conducted in ethnobotanical garden at UTHM Parit Raja Campus. A list of plant species and their ethnobotanical displays are shown in Fig. 1.

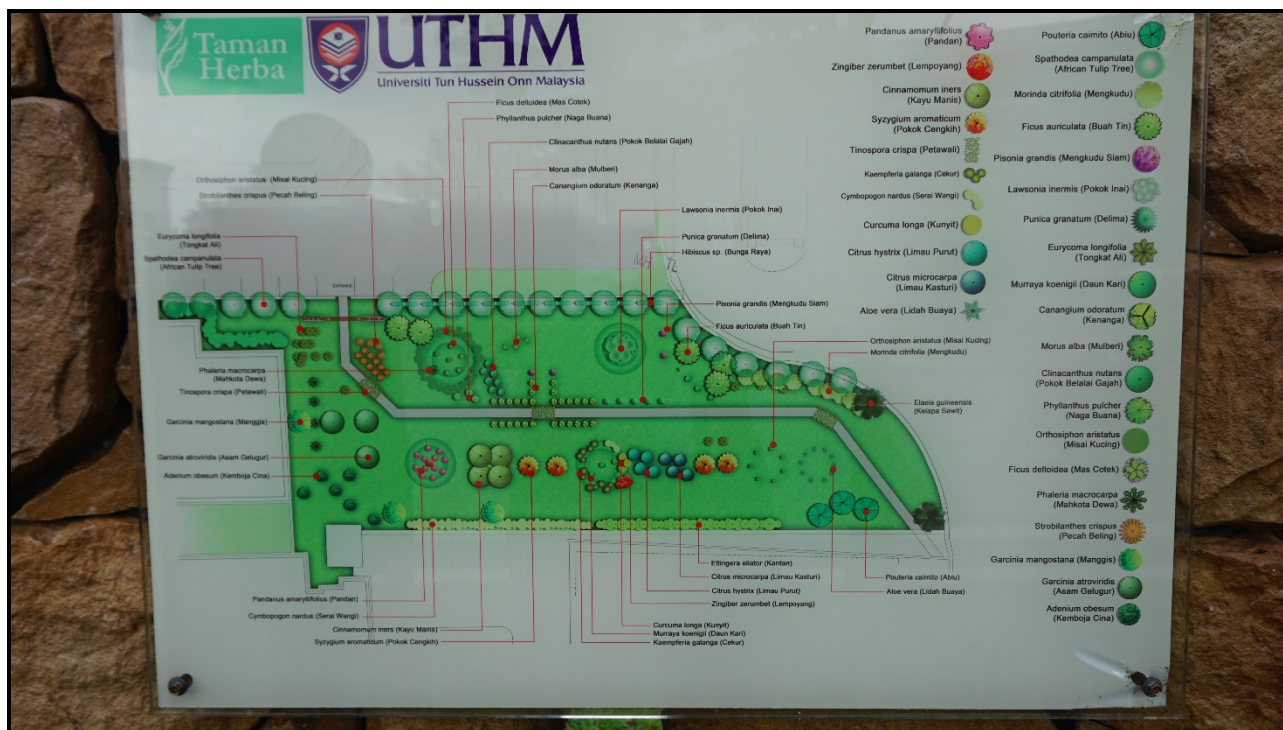


Fig. 1 - List of plant species and their ethnobotanical displays

2.2 Ethnobotanical Documentation

The ethnobotanical documentation was carried out based on the plant species that are available in the UTHM ethnobotanical garden. The information of plant species were collected from the secondary data through Google Scholar, GlobinMed, PubMed, Scopus and Science Direct. The search terms for data collection were the common names of plants, plant description, chemical constituents and traditional uses by locals in Malaysia. The pictures of each plant species were taken in order to give an illustrated guide to the viewers who visit the website. All the research data were recorded on the digital website (<https://ethnobotanicalgard.wixsite.com/ethnogardenuthm>).

For the detail of website design, the digital website is named as Ethnogarden UTHM and was created by Wix.com. The content of Ethnogarden UTHM website is categorized into 5 sections, which are the homepage of the website, the information about the website, the gallery containing the pictures and information about the plant species, the glossary of the website and the contact information regarding the website.

2.3 Qualitative Evaluation

An online survey was done in the study to understand the level of knowledge among the UTHM students regarding the utilization of plants and also to evaluate the effectiveness of ethnobotanical garden UTHM website towards conservation and promotion of traditional knowledge. The questionnaires were distributed online through Google Form in dual language, which were Malay and English. A total of 30 respondents from different faculties at UTHM were acquired in the survey. The information with regards to demography background of respondents, the students'

understanding of the uses of the herbal plants, conservation of plants, and the ethnobotanical garden and its digital website were collected through questionnaires. The descriptive analysis was conducted by frequency analysis [7].

3. Results

3.1 Documentation of Plants at Ethnobotanical Garden

Fig. 2 illustrates the plant species that are found in the ethnobotanical garden at UTHM Parit Raja Campus. A total of 23 plant species were recorded and they are *Ficus auriculata* (Buah tin), *Eurycoma longifolia* (Tongkat ali), *Garcinia atroviridis* (Asam gelugor), *Averrhoa bilimbi* (Belimbing buluh), *Phaleria macrocarpa* (Mahkota dewa), *Gardenia jasminoides* (Bunga cina), *Garcinia mangostana* (Manggis), *Ficus deltoidea* (Mas cotek), *Clinacanthus nutans* (Belalai gajah), *Tinospora crispa* (Patawali), *Strobilanthes crispus* (Pecah beling), *Cymbopogon nardus* (Serai wangi), *Pandanus amaryllifolius* (Pandan), *Etilingera elatior* (Kantan), *Orthosiphon aristatus* (Misai kucing), *Canangium odoratum* (Kenanga), *Morus alba* (Mulberi), *Syzygium aromaticum* (Bunga cengkih), *Lawsonia inermis* (Inai), *Citrus microcarpa* (Limau kasturi), *Citrus hystrix* (Limau purut), *Morinda citrifolia* (Mengkudu) and *Hibiscus-rosa-sinensis* (Bunga raya). All the information pertaining to the studied plants were recorded on the Ethnogarden UTHM website.

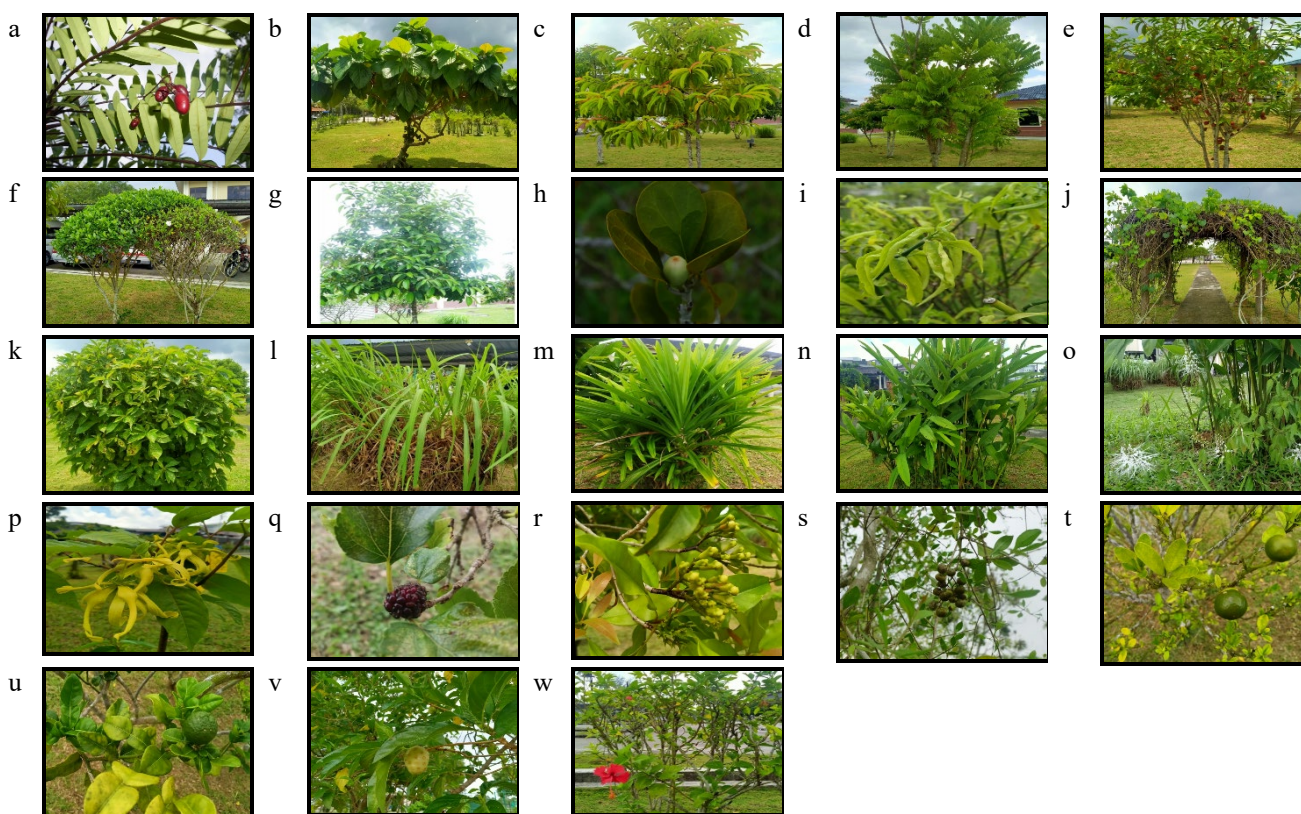


Fig. 2 - The plant species found in the ethnobotanical garden at UTHM Parit Raja Campus.

- (a) *Eurycoma longifolia* (Tongkat ali); (b) *Ficus auriculata* (Buah tin); (c) *Garcinia atroviridis* (Asam gelugor); (d) *Averrhoa bilimbi* (Belimbing buluh); (e) *Phaleria macrocarpa* (Mahkota dewa); (f) *Gardenia jasminoides* (Bunga cina); (g) *Garcinia mangostana* (Manggis); (h) *Ficus deltoidea* (Mas cotek); (i) *Clinacanthus nutans* (Belalai gajah); (j) *Tinospora crispa* (Petawali); (k) *Strobilanthes crispus* (Pecah beling); (l) *Cymbopogon nardus* (Serai wangi); (m) *Pandanus amaryllifolius* (Pandan); (n) *Etilingera elatior* (Kantan); (o) *Orthosiphon aristatus* (Misai kucing); (p) *Canangium odoratum* (Kenanga); (q) *Morus alba* (Mulberi); (r) *Syzygium aromaticum* (Pokok bunga cengkih); (s) *Lawsonia inermis* (Pokok inai); (t) *Citrus microcarpa* (Limau kasturi); (u) *Citrus hystrix* (Limau purut); (v) *Morinda citrifolia* (Mengkudu); (w) *Hibiscus rosa-sinensis* (Bunga raya)

3.2 Qualitative Evaluation

A total of 30 students from different faculties at UTHM were involved in the survey. Fig. 3 shows the demographic data of respondents. Among the respondents, half of the group were males (50%) and another half of the group were females (50%), aged between 18 to 20 years (16.7%, n=5), 21 to 23 years (70%, n=21) and 24 years and above (13.3%, n=4) from different races in Malay (63.3%, n=19), Chinese (16.7%, n=5) and Indian (20.0%, n=6). The numbers of respondents were recorded in a list of faculties: Faculty of Civil and Environmental Engineering (16.7%, n=5), Faculty of Electrical and Electronic Engineering (10%, n=3), Faculty of Mechanical and Manufacturing Engineering (10%, n=3), Faculty of Technology Management and Business (13.3%, n=4), Faculty of Computer Science and Information Technology (13.3%, n=4), Faculty of Technical and Vocational Education (16.7%, n=5) and others (20%, n=6).

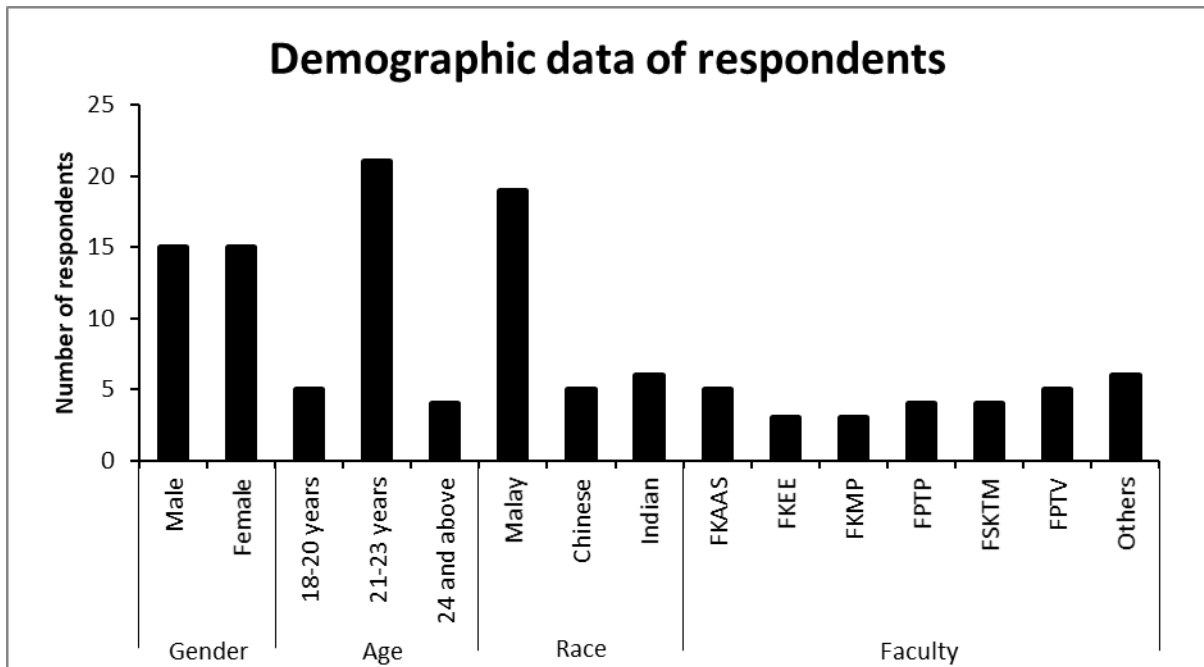


Fig. 3 - Demographic data of respondents.

The data are categorized based on gender, age, race and faculty. In the aspect of faculty, FKAAS refers to Faculty of Civil and Environmental Engineering; FKEE refers to Faculty of Electrical and Electronic Engineering; FKMP refers to Faculty of Mechanical and Manufacturing Engineering; FPTP refers to Faculty of Technology Management and Business; FSKTM refers to Faculty of Computer Science and Information Technology; FPTV refers to Faculty of Technical and Vocational Education

Based on the data gathered from the survey (Table 1), all respondents (100%, n=30) understood the importance of plant in daily life. They were well-informed about the important functions of plants including providing oxygen (13.3%, n=4) and providing both oxygen and food (86.7%, n=26). Most of the respondents knew about the utilization of plants as food (36.7% agreed, n=11; 53.3% strongly agreed, n=16), medicines (40% agreed, n=12; 50% strongly agreed, n=15), dyes (56.7% agreed, n=17; 33.3% strongly agreed, n=10) and cosmetic products (46.7% agreed, n=14; 36.7% strongly agreed, n=11). Only 30% and 13% of respondents (n=13) agreed and strongly agreed that there are people depending more on the traditional uses of plants compared to modern medication for medicinal purpose, whereas 13% and 7% of them (n=6) disagreed and strongly disagreed with the statement and the remaining (37%, n=11) was uncertain about it.

Table 1 - Understanding of the importance and utilization of plants among UTHM students

Perception	Category	Number of respondent (n)	Percentage
Are plants important in daily life?	Yes	30	100%
	No	-	-
Important functions of plants	Provide oxygen	4	13.3%
	As a food source	-	-
	All of the above	26	86.7%
	Uncertain	-	-
Utilization of plants: Cosmetic products	Strongly disagree	3	10%
	Disagree	2	6.7%
	Agree	14	46.7%
	Strongly agree	11	36.7%
Dyes	Strongly disagree	3	10%
	Disagree	-	-
	Agree	17	56.7%
	Strongly agree	10	33.3%
Food	Strongly disagree	2	6.7%
	Disagree	1	3.3%
	Agree	11	36.7%
	Strongly agree	16	53.3%
Medicines	Strongly disagree	3	10%
	Disagree	-	-
	Agree	12	40%
	Strongly agree	15	50%
People depend more on traditional plant-based medicine	Strongly disagree	2	7%
	Disagree	4	13%
	Agree	9	30%
	Strongly agree	4	13%
	Uncertain	11	37%

Table 2 summarizes the perception of plant conservation among the respondents. About 60% of the respondents (n=18) were aware of the significance of plant conservation in all 3 aspects: preventing the plants from extinction, aiding in ecosystem conservation and sustainable use for the future generation. About 60% of the respondents (n=18) supported the tree planting activity and 20% of the respondents (n=6) preferred ex-situ plant conservation by establishing ethnobotanical garden, while the others suggested to enforce the laws (10%, n=3) and also create the forest reserves (10%, n=3).

Table 2 - Perception of plant conservation among UTHM students

Perception	Category	Number of respondent (n)	Percentage
Purpose of plant conservation	Prevent plants from extinction	3	10%
	Maintain a healthy ecosystem	3	10%
	Sustainable use for future generation	6	20%
	All of the above	18	60%
Suggestions for plant conservation	Tree planting	18	60%
	Laws enforcement	3	10%
	Maintain forest reserves	3	10%
	Ex situ conservation	6	20%

As Table 3 notes, the number of student visiting the ethnobotanical garden, UTHM Parit Raja Campus was higher, which is about 60% (n=18), and 54% of the students (n=16) could identify the plant species present in the garden. From the result of the survey, about 60% and 23% of the respondents (n=25) agreed that the development of ethnobotanical garden website could deliver the traditional knowledge effectively and they would promote this website to their families and friends. More than half of the respondents (56%, n=17) also agreed and interested to practice the traditional uses of plants after gaining the knowledge, but 37% of them (n=11) were uncertain about it.

Table 3 - Evaluation on the development of ethnobotanical garden online website

Perception	Category	Number of respondent (n)	Percentage
Visiting Taman Herba, UTHM Parit Raja	Yes	18	60%
	No	10	33%
	Uncertain	2	7%
Plant identification	Yes	16	54%
	No	7	23%
	Uncertain	7	23%
Effectiveness of the traditional knowledge sharing through the ethnobotanical garden website	Strongly disagree	-	-
	Disagree	1	3%
	Uncertain	4	14%
	Agree	18	60%
	Strongly agree	7	23%
Promoting the website	Yes	22	73%
	No	2	7%
	Uncertain	6	20%
Practicing the traditional use of plants	Yes	17	56%
	No	2	7%
	Uncertain	11	37%

4. Discussion

Plants form an essential part in our daily lives. Plants and trees take in large quantity of carbon dioxide and release oxygen into the atmosphere during photosynthesis process [8]. Furthermore, plants filter the air and improve the quality of air that we breathe [8]. Plants also make up of the largest proportion of our diet [9]. In addition to food consumption and air regulation, plants and herb species are used in a wide array of sectors such as pharmaceutical, perfumery, biopesticides, and various food products including functional food and supplements, as well as for cosmetic products or coloring material [10]. Based on the research of Mathur [11], more than 150 plant species were identified with their medicinal, economic, ethnical and environmental values, additionally, Seth [12] also reviewed the ecological and environmental uses, educational and recreational values as well as the economic importance of trees. While in this study, the functions of plants as a main source of food and their impact to environment as well as their utilization on various production and manufacturing industries are well-known among the respondents from different faculties.

However in the aspect of medicinal value of plants, about 20% of the respondents disagreed that there are people relying more on the traditional medicinal plants for healing purpose and more than 30% were uncertain about it. It is reported that the knowledge of herbs and traditional uses of plants were greatly affected by the families and education [13]. Majority of the respondents were from engineering courses, hence they are not exposed to the herbs-related courses, resulting in lacking of the knowledge regarding the traditional medication. Most of the young generation has limited skills, knowledge and experience of using traditional medicinal plants or herbs. This statement is supported by the study of Zimmerman and Kandiah [14] and it could explain the result of the current study, in which the age groups of the respondents involved in the survey were between 18 to 24 years old.

Granted that the young generation is unsure or unfamiliar with the traditional medication, but the majority of the respondents understood the basic concept and importance of plant conservation. Taking a broad view of plant conservation, it helps to protect and prevent the plants and also animals, especially the endangered and rare species from extinction. For this reason, creating a forest reserve and preserving the natural habitats of native trees and plants can protect a large area of vegetation and secure the food source and shelter for the animals [15]. Another method suggested by the respondents was the laws enforcement. The laws should be implemented strictly by prohibiting the activities such as agricultural expansion, illegal logging and over-exploitation of natural resources in order to maintain a balanced ecosystem [16]. In fact, preservation of traditional knowledge may interrelate with the preservation and conservation of biodiversity. Protecting the lands and forest resources is equally important to the indigenous communities who subsist on the forests for their consumption, trade and traditional way of healing [17]. Thus, conservation of plant and natural resources can prevent the erosion of traditional culture, at the same time, promoting the traditional knowledge can be advantageous to the sustainable use of resources for the benefit of the future generation [18]. The present results show that all respondents were aware of plant conservation by providing reasonable suggestions and it is comparable to the survey conducted by Maharaj-Sharma [19].

From their point of view as a student, most of the respondents supported the tree planting activity. A similar result is observed in the survey of Maharaj-Sharma [19] as most young people viewed planting trees as an important conservation practice. In addition, hand-on activities such as planting tree, naming and identifying tree significantly improve the participants' attitudes towards knowledge of plant and plant conservation [20]. Ex situ plant conservation

with the establishment of ethnobotanical garden was also a supportive method among the choices. Apart from plant conservation, ethnobotanical garden plays an important role in education and revitalization of traditional knowledge [21]. A study demonstrated that the medicinal plants and stimulant herbal medicines were of above-average interest among the students and the result is significant for a learning setting such as the establishment of botanical garden [22]. As a result, most of the respondents have visited the ethnobotanical garden at UTHM Parit Raja Campus and they could identify the plant species that planted in the garden. The positive outcome indicates that UTHM students have their intention to visit the ethnobotanical garden and their willingness to learn about the plants and their traditional uses.

In this era of technology, an online website not only provides a good platform for promoting businesses, but is also used as a tool in education system to deliver knowledge. The website plays a critical role in the exploration of ideas and information exchange all over the world [23]. A web-based ethnobotanical database named as Ewé was developed to document the therapeutically important plant species of Brazil and their modes of traditional uses [24], while another web-based ethnobotany database was created to record the traditional utilization of medicinal plants of Dayak tribe in Borneo [25]. These tools are expected to be a source of knowledge sharing between home-users as well as academic and non-academic groups. Therefore, developing the Ethnogarden UTHM website is applicable because UTHM students have all the information about plants and their traditional uses at the end of their fingertips.

Furthermore, the students were willing to promote the website to their friends and families. A research showed that the informative services or products significantly impacts on knowledge-sharing willingness [26]. Knowledge sharing in social networks promotes knowledge learning and also improves the social value, which indicates that the willingness of students promoting the website would be another effective way to spread the awareness about the need of traditional knowledge and plant conservation. Surprisingly, the result also found out that the students were interested to practice the traditional uses of plants in order to sustain and preserve the culture. This finding is in comparable to the study of Arumugam [27], which revealed that young people showed a positive attitude towards the usage of herbal medicines and supplements. However, the wrong choice and preparation of traditional medicinal plants were noted among the students in the literatures [28-29]. These factors could be a concern among the 37% respondents, who were uncertain about the idea of practicing traditional use of plants and herbs.

5. Conclusion

In brief, all the respondents realized the importance of plants and plant conservation for the aims of protecting the plants from extinction, balancing an ecosystem and using the resources sustainably without compromising the needs of future generation. However, they possessed very little knowledge on the traditional uses of plants or herbs for medicinal purpose. As with the development of ethnobotanical garden UTHM website, they could easily access the information of the plant species such as their common name, plant description, chemical constituents and traditional uses for disease treatment in Malaysia. Hence, this study proved that the development of Ethnogarden UTHM website is an effective platform to enrich the traditional knowledge and promote the plant conservation among the UTHM students.

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